

**CHAPTER 4**  
**GRASSED SWALES**

## CHAPTER 4: GRASSED SWALES

### DEFINITION

Grassed swales are shallow, vegetated, manmade ditches designed so that the bottom elevation is above the ground water table to allow runoff to infiltrate into the ground. The vegetation prevents erosion, filters sediment and provides some nutrient uptake (United States Environmental Protection Agency, 1993).

### EFFECTIVENESS

Grassed swales have moderate ability to remove pollutants from stormwater. Unless the underlying soils allow for infiltration, swales have a limited capacity to remove soluble pollutants (New York Department of Environmental Conservation, 1992). Grassed swales are typically applied in single family residential developments and highway construction as an alternate to curb and gutter drainage systems (Schueler, 1987). Actual performance will be influenced by grass cover (extent, density, etc.), soil, runoff quality, and channel design. Research on removal effectiveness of grassed channels has shown the length should be at least 100 feet for adequate TSS removal (80%). This channel length will also remove about 60% of lead in runoff (United States Department of Transportation, 1988).

The United States Environmental Protection Agency (1993) lists the following percent removals for grassed swales:

Pollutant	TSS	TP	TN	COD	Pb	Zn	Factors
Average	60	20	10	25	70	60	Runoff vol
Reported Range	0 - 100	0 - 100	0 - 40	25	3 - 100	50 - 60	Slope Soil infil
Probable Range	20 - 40	20 - 40	10 - 30	--	10 - 20	10 - 20	Veg cover
No. Values	10	8	4	1	10	7	Length Geom.

### PLANNING CONSIDERATIONS

Grassed swales are most applicable in residential and other areas of low to moderate density, where the percentage of impervious area is small. The permeability or final infiltration rate of the

soil will limit the utilization of swales for infiltration of runoff. The maximum allowable ponding time for swales is 24 hours (Maryland Department of the Environment, 1984). There should be a minimum distance of 2 feet between the bottom of the swale and the seasonal high water table, to provide for adequate infiltration. The minimum separation between the swale and any component of an individual sewage disposal system shall be as stated in the subsurface disposal system rules.

The United States Environmental Protection Agency, (1993) lists the following advantages and disadvantages for grassed swales:

#### ADVANTAGES

- Requires minimal land
- Can be used as part of runoff conveyance system to provide pretreatment
- Can provide sufficient runoff control to replace curb and gutter in single-family residential subdivisions and on highway medians
- Economical

#### DISADVANTAGES

- Low pollutant removal rates
- Leaching from culverts and fertilized lawns may actually increase the presence of trace metals and nutrients

#### DESIGN CRITERIA

Minimum length 100 feet.

Swale bottom slopes as flat as possible. swale can be terraced to achieve flat slope.

Swale side slopes no-steeper than 3:1 (h:v)

Maximum water velocity during a ten year storm of one foot per second (fps).

Maximum flow during the design storm of ten cubic feet per second (cfs).

A dense cover of water tolerant, erosion resistant grasses should be used.

Underlying soils should have sufficient percolation rate so that the swale will drain in twenty-four hours.

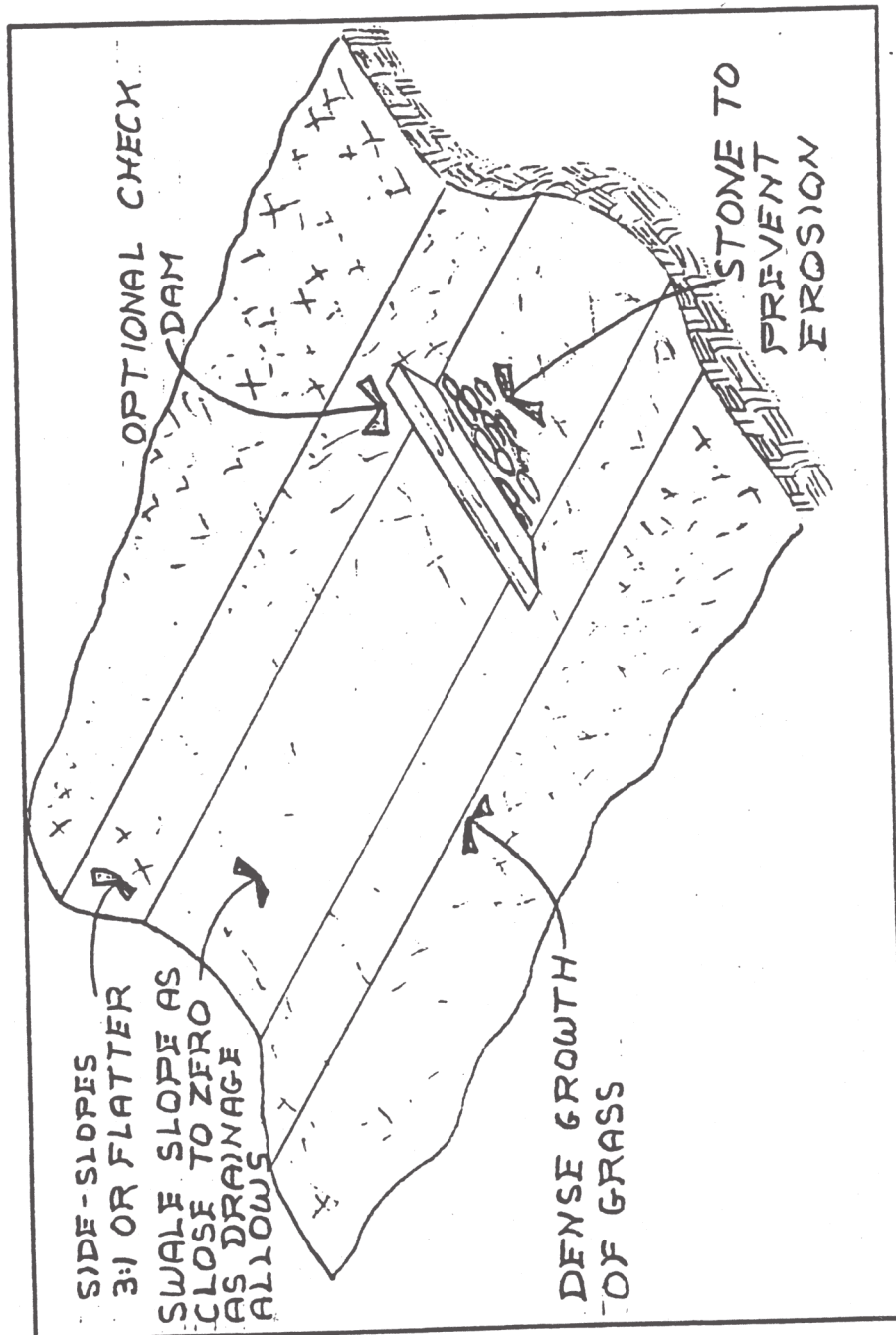
The bottom of the swale should be at least two feet above the seasonal high water table and bedrock.

Check dams are recommended to promote pollutant removals.

Erosion protection as required should be provided at the swale inlet and outlet.

Swale should be capable of conveying design storm of upstream drainage system without eroding.

Figure 4.1: Schematic of a Grassed Treatment Swale (adapted from Schueler, 1987)



## **MAINTENANCE REQUIREMENTS**

Swales should be mowed at least once per year to prevent the establishment of woody vegetation.

Sediments should be removed as required, and swale reseeded if necessary.

Grass should not be mowed to less than three inches in height.

## **REFERENCES**

Maryland Department of the Environment, Sediment and Stormwater Administration, Standards and Specifications for Infiltration Practices, February 1984.

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New York Department of Environmental Conservation, Reducing the Impacts of Stormwater Runoff from New Development, April 1992.

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Schueler, Thomas R., Controlling Urban Runoff: A practical Manual for Planning and Designing Urban BMP's, Metropolitan Washington Council of Governments, July 1987

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United States Environmental Protection Agency, Region V, The Decisionmaker's Stormwater Handbook a Primer, April 1992.

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